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Science News x

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STUDIES OF ATOMIC NUCLEI[1]

IT is well known that a study of the single scattering of α particles by the elements led to the nuclear theory of the atom, and has provided us with a direct method of measuring the nuclear charge of the elements. The pioneer experiments in this field were made by Geiger and Marsden in 1913, who showed that the number of particles scattered at different angles was in close accord with the nuclear theory, assuming an inverse square law for the forces between the α particle and the nucleus. The variation of scattering with velocity of the α particle was in close accord with this law. Their results were subsequently extended by the experiments of Chadwick, who made direct measurements of the nuclear charge. Most of the experiments of Geiger and Marsden were made with silver and gold. Using α particles of average range about 4 cms of air, they found that the law of inverse square held, at any rate approximately, for the closest distance of approach of the α particle, *viz.*, about 4×10^{-12} cms for gold. These results suggested that the nuclei of even the heavy elements must be of radius less than this small distance.

In a collision of an α particle with a light atom the distance of approach in a close collision is much smaller than the above, and direct evidence has been obtained that the law of the inverse square breaks down completely in the case of a close collision between an α particle and a hydrogen nucleus. More recently Bieer compared the scattering of α particles by aluminium and gold, and found the relative number of particles scattered by aluminium and gold to decrease as the angle of scattering was increased. Assuming that the scattering by gold was normal—*i.e.*, in agreement with an inverse square law—he suggested that the discrepancy in aluminium might be due to the combined action of an attractive force superimposed on a normal repulsive force. From calculation he concluded that an attractive force varying as r^{-4} fitted in best with his experimental results. In the light of these conclusions it became of importance to re-examine the question whether the law of inverse square holds accurately for the heavy elements for the closest possible distances of approach, and to determine as accurately as possible the variation of the scattering with velocity for the lighter elements.

[1] Abstract of a lecture given before the Royal Institution of Great Britain, March 27, 1925.

For this purpose, Dr. Chadwick and I have used a modified method, and examined for a number of elements the scattering at an angle of about 135°, for α particles of different velocities. The source of α rays (radium B and C deposited on a metal disc) was hermetically sealed in a brass tube covered at one end by a thin film of collodion of stopping power about 2 to 3 mm of air for α rays. This was necessary to avoid radioactive contamination. The α rays fell on the radiator of small area of stopping power 2 to 5 mms of air carried on a frame of Acheson graphite. Extra care was taken to avoid extraneous scattering. By introducing thin sheets of mica of known stopping power in the path of the α rays, the variation of the number of α particles with velocity was directly determined. In this way measurements were made for α particles between the ranges of 6.7 cms and 2 cms. The straggling of the α particles in their passage through the mica made this method unreliable for shorter ranges of the α particles.

In this way it was found that the number of particles scattered by silver and gold through an average angle of about 135° varied inversely as the square of the energy of the incident α particles over the whole range. In the case of gold measurements were also made for smaller angles by the direct method of measuring the nuclear charge, previously used by Chadwick, and no variation in the law of the inverse square could be observed. Similar results were observed with a thin film of uranium obtained on graphite by sputtering. In this case it was difficult to determine the actual thickness of the film, but the variation in number of scattered α particles with velocity followed the regular law.

In the case of aluminium an unexpected result was observed. The scattering for 6.7 cms α particle was less than the theoretical, and rapidly *decreased* as the velocity of the α particles was diminished, falling to a minimum for particles of range about 5 cms. It then increased again and tended towards the theoretical value for slow-speed α particles. It is of interest to note that the velocity of the α particles for this minimum of scattering is about the same as the minimum velocity required to liberate protons from aluminium. It should be mentioned that even for the swiftest α particle the number of protons of range greater than 3 cms which appeared at an angle of 135° was only a small fraction of the total number of scattered α particles, indicating that the expulsion of a proton does not occur in all close collisions of the α particle with the nucleus.

From the observations on the scattering by a film of uranium, it is clear that the law of inverse squares holds, at any rate approximately, up to the closest distances of approach—*viz.*, about 3×10^{-12} cms. This raises a difficulty, since from radio-active evidence it is believed that the nuclear structure of uranium extends to a distance of about 7×10^{-12} cms. If the α particle liberated in the disintegration of uranium gains most of its energy in escaping in the repulsive field of the nucleus, its position before disintegration can not be less than 7×10^{-12} cms from the center of the nucleus, and may be greater if it is liberated with initial energy. It is for this reason that it has been considered probable for some time that the radio-active elements consist of a central charged nucleus surrounded at a distance by a satellite distribution of positively and negatively charged particles. If these form a symmetrical doublet-like structure extending over a short linear distance, it may be difficult to detect the presence of such a satellite distribution by direct scattering experiments. A similar idea may be used to explain the peculiar behavior of the aluminium nucleus. In such a case the distance apart of the satellites or doublets may be comparable with their distance from the main nucleus. It is easy to see on such an assumption that α particles of appropriate speed may just enter the satellite region where the electrical field may be relatively weak, and thus show a marked defect in scattering. Swifter particles pass through the satellite distribution and come under the strong electric field of the central nucleus, where they are more effectively scattered.

It is obvious that an accurate determination of the scattering of α particles by the elements may supply important evidence, not only on the size of the nucleus, but on some of the details of its structure. A large amount of accurate data will be required to test the adequacy of any theory of nuclear structure.

Since the proof that protons can be expelled from the nuclei of many light elements, the fate of the bombarding α particle after the disintegration has been a matter of conjecture. To throw light on this question Blackett has recently photographed by the well-known expansion method the tracks of more than 400,000 α particles in nitrogen. In addition to a number of branching tracks which obey the laws of a perfectly elastic collision, eight branching tracks were observed in which the laws of an elastic collision were not obeyed. In these photographs the fine track of the proton was clearly visible, and also that of the recoiling nucleus, but in no case was there any sign of a third branch due to the escaping α particle. He concluded that the α particle was captured in a collision which led to the ejection of a proton. The branches were co-planar, indicating that momentum was conserved in such collisions. The length of the tracks of the proton and recoiling nucleus was in good accord with such an assumption. These ex-

periments suggest, at any rate in the case of nitrogen, that the α particle is captured by the nucleus. If no electron is expelled, the resulting nucleus should have a mass $14+4-1=17$, and a nuclear charge $7+2-1=8$—*i.e.*, it should be an isotope of oxygen. It thus appears that the nucleus may increase rather than diminish in mass as the result of collisions in which a proton is expelled.

ERNEST RUTHERFORD

UNIVERSITY OF CAMBRIDGE

MACKENZIE PARK AS A FIELD FOR SURVEY, EXPLORATION, LITERATURE AND ART

MACKENZIE PARK and the surrounding district affords a splendid opportunity for university summer parties, students, professors and others desiring a field in which to carry on surveys and explorations, writing and art work, for practice, experiment or other purposes. Mackenzie Park is the name locally applied in the Norway of Canada to a strip of country approximately twenty miles north and south by seventy miles east and west lying near the southern edge of the bottom lands of Bella Coola River and the eastern shore of South Bentinck Arm. Mackenzie Park is at the head of one of the longest fiords midway of the coast of British Columbia. It was so named in honor of Sir Alexander Mackenzie, the first white man to cross America north of Mexico and, who, surfeited with scenery in his long trip from Montreal through the Canadian Rockies, wrote superlatively of the scenery of the area now known as Mackenzie Park.

A petition has been made that this area might be turned over for administration by the Dominion Parks as a great out-of-doors museum and sanctuary for the conservation of animal and plant life, beautiful scenery and pure water. Any surveys and explorations, literature and art treating of the park or vicinity would be conducive to this end.

As a field for physiography, topography and mapping the area is excellent, being unsurveyed British Columbia Crown lands extending from sea level to about 10,000 feet altitude. It consequently affords ample opportunity for either practice or practical work. An aeroplane photographic survey would be useful in developing the park.

From the geographic and geological standpoint, many parts of the park have never been seen by white men. The many glaciers and waterfalls should prove of interest. From one point on Mackenzie Highway eighteen glaciers may be seen. Southeast and partly within the park is a glacier which is said to be forty miles long. The great number of glaciers ensures that a variety of glacial problems may be presented. Two glaciers may be seen from the Bella Coola Post Office and another from a point one mile up the road. In the park are thousands of waterfalls, some of them large. One near the eastern edge of the park is said by reliable frontiersmen to make a clear leap of over 828 feet. If this be true, it is the fifth highest known fall in the world, second highest in the western hemisphere and the highest in Canada. Surely the opportunity to first measure this fall or to take good large photographs, motion pictures, sketches or paintings of it should appeal to many university students or men of leisure. Hot springs are found on South Bentinck Arm.

From a botanical standpoint the park and surrounding region are practically unknown. Great variety of plant life and plant problems may be expected in this area, which extends from the sea, salt marshes and lowlands to the mountain peaks on the one hand and which presents climatic conditions ranging from the rather moist sea coast climate to the semi-arid conditions of the region embracing the eastern end of the Bella Coola valley where irrigation is practiced. Throughout the region there are four species of giant trees, thousands of them being over six feet in diameter—red cedar, cottonwood, Douglas fir and aeroplane spruce. On the western edge of the park the vegetation is luxuriant and semi-tropical. On the east are Jack-pine barrens.

Zoologically the area is interesting. Grizzly bear tracks may certainly be found within twenty-four hours after arrival at Bella Coola, at least in August or September. A hunter living near Mackenzie Highway in 1924 left home in the morning, went on foot to a glacier in the park not far distant and was able before supper time to bring back a mountain goat. Fourteen eagles have been counted on a single stub at the edge of the park area. The sea is very deep off Bella Coola and in it is such life as sea fans and sand sharks. The several varieties of salmon taken in North Bentinck Arm for the two canneries within five miles of Bella Coola offer many zoological problems.

From the anthropological standpoint the Bella Coola Indians are of interest. They are of the Salish linguistic stock and North Pacific Coast culture. They live within two miles of Bella Coola and may be seen working for the canneries. About one fifth of the known petroglyphs of Canada lie within a day's motorboat run of Bella Coola. The material culture, social organization and folk-lore of the Bella Coola has been studied for the National Museum of Canada, but much remains to be done. In archeology, linguistics and physical anthropology, the field is almost untouched. The rituals and dramas may still be seen

on occasion by the sympathetic, but they can not be easily seen by the typical tourist.

Carrier and Chilcotin Indians, who both belong to the Athapascan linguistic stock, visit Bella Coola and camp at several places in the valley during the summer. Each group stays several weeks and some of them return a number of times in the season, producing a picturesque subject for observation and study. Much yet remains to be done on the ethnology, archeology, folk-lore, physical anthropology and linguistics of these people.

In 1895 a colony of about 200 people of Norwegian extraction settled in the Bella Coola valley. These fine, sturdy, hospitable Canadians still occasionally prepare Norwegian dishes, do Norwegian carving, painting and embroidery and a few still have examples of the old country costume and jewelry. Here is opportunity for the study of folk-lore, carving and painting.

To the literary man, the district presents many features of interest. There are two types of Indians, one a sea coast communal sedentary folk, the other horsemen of somewhat nomadic habits. There is all the charm of the Norwegian fishermen living on farms, and the loggers engaged in hand, horse and railroad logging. All the races meet in the salmon canneries with their cosmopolitan crews of Norwegians and Chinamen, Japs and Indians, to say nothing of the Scotch engineer, the French-Canadian and the "American." There is also the romance of the trappers and prospectors that has not yet been adequately told. The cowboy life that drifts down from the interior and may usually be seen in evidence at Bella Coola and the Indian horse-men and horse-women are perhaps less modernized than anywhere else in Canada.

All the subjects of such great interest to the student and literary man have an equal attraction for the artist, the movie operator and the artist-photographer. Within or adjacent to the park are strange and wonderful types of men, glaciers and waterfalls. Within the forests are vast green roofed "cathedrals," pillared with tree trunks, carpeted with moss and illuminated by sunlight strained through green leaves and lending a glamor to the scene that can not be simulated by the man-made stained glass.

This region is reached by a weekly steamer from Vancouver for Bella Coola at a cost of $20.20, one way, including meals and berth. The traveler usually leaves Vancouver Wednesday night and reaches Bella Coola sometime Sunday, and has a good opportunity to see intimately the natural resources, industries and life of the coast as the steamer stops at Indian villages, salmon canneries and logging camps, often for a considerable time. Wholesome meals may be had throughout the Bella Coola valley at fifty cents and bed at the same rate.

The western edge of the park and part of the northern edge can be viewed from motor or sail boats on North and South Bentinck Arms. The next section of the northern edge of the park is adjacent to the automobile road, locally known as Mackenzie Highway, which now extends up Bella Coola valley for forty-one miles. Beyond this is a good pack trail for horses. Along the land route mentioned are post offices at Bella Coola, Hagensborg and Atnarko. There is telegraph communication with the outside world from Bella Coola and Atnarko. One may live in delightful simplicity and comfort at various places along the Bella Coola valley road with telephone and weekly mail service and yet walk in the park area to some glaciers and many waterfalls and return home in time for supper.

Here one may live in comfort among a picturesque and primitive pioneering people with unequalled scenery of mountains, glaciers and virgin forests at his very door. The person who longs for a complete change and yet hesitates to break connection with his business may enjoy all the wilderness that his heart calls for and yet be within telegraphic communication with the world of affairs. As a location for the summer field work conducted by many of the universities, Mackenzie Park is unequalled, since here is presented opportunity for study of several lines of natural history. Contributions to such study will be to the benefit of the park proper and to the country in general.

HARLAN I. SMITH

OTTAWA, CANADA

THE UNSATISFACTORY STATUS OF THE GLACIAL CONTROVERSY*

INTEREST is revived in the problems of the cause or causes of "glacial periods" by the conclusions expressed in the well-written "Text-book of Geology," by Professors Pirsson and Schuchert.[1]

There are no more controverted and widely discussed problems in geology and terrestrial physics than those connected with the cause or causes of the glaciations, which, during short intervals throughout geologic time and at widely separated latitudes, have left their traces in and upon the crust of the earth. From the earliest Proterozoic to the present time tillites and tills mark glacial action.

In this latest authoritative text we find the following unsatisfactory conclusion, which fully expresses the general consensus of opinion on the subject, both as to the separate and combined causes.

* See also, "Ancient climates," *Scientific Monthly*, May, 1925, pp. 459–479.

[1] 1924, 2nd Edition, Jno. Wiley & Sons, Inc.

GLACIAL CLIMATES

As yet there is no accepted explanation of why the earth from time to time undergoes glacial climates, but it is becoming clearer that they are due rather to a combination of causes than to a single cause. Probably the greatest single factor is the high altitude of continents, with great chains of new mountains (the hypsometric causes) which disturb the general direction and constitution of the air currents (the atmospheric causes) and the ocean currents as well.[2]

It is permissible to state, however, that the glacial climates are irregular in their geologic appearance, are variable latitudinally, as seen in the geographic distribution of the tillites between the poles and the equatorial region, and finally that they appear in geologic time as if suddenly introduced.[3]

Now, there is no adequate evidence that the earth as a whole has ever gone through a glacial climate. Local and alpine glaciations have recorded themselves time and time again in all latitudes between polar and equatorial regions; and there have undoubtedly been two great glaciations, that of Permo-Carboniferous and that of Pleistocene time. These were widely apart in latitude, and neither encroached upon the glaciated latitudes of the other, although there was a notable lowering of the snow line in tropical and equatorial latitudes in the final chill of Pleistocene time.

These glaciations were separated in time by the vast interval between the Paleozoic and the dawn of the Postglacial or Human Epoch. The former, with its maxima localized between latitudes $\pm$ 15° and 35°, and the latter with its maxima in about latitudes $\pm$ 50° to 55°.[4]

These maxima approximately coincide respectively with the arid and the north and south temperate rain belts of to-day, the former at the beginning, and the latter at the close of the vast geologic interval above mentioned.

There is abundant evidence that during all these glaciations, except the last, the oceans remained genial, and in this last glaciation the chill was restricted to oceans in polar and mid-latitudes; equatorial and adjacent oceans remained genial or similar to the genial and mild ocean temperatures which were so widely distributed throughout geologic time.[5]

But locally and at widely separated latitudes temperature fluctuations upon continents were far different. "The hypsometric causes" probably operated actively in most of the known instances of glaciation, but in the great zonal glaciations of the Permo-Carboniferous and of Pleistocene time these causes do not appear to have exercised any effective control, for the glacial flows seem to have overridden mountain ranges and extended to and, in some instances, into oceans remote from the centers of dispersion.

Realizing that the ratio of ocean areas to continental areas is and probably within geologic time has not been far from 3 to 1 and that the two great zonal glaciations were separately restricted to less than half the remaining continental areas, it is difficult to see how it can be said that "the earth from time to time undergoes glacial climates." It appears rather that glaciations, even in these great extensions, were local phenomena, which from time to time were imposed upon restricted portions of continents; and were imposed upon oceans but once, and were then restricted to polar and mid-latitude regions. There is, therefore, a manifest need, even in this latest text, for a thorough reconsideration of the subject, not only of the causes of glaciation, but of the long and widespread genial conditions which were interrupted by short local glaciations as recited in the text under consideration.

Referring to variation in solar radiation as a cause of glaciation, the authors say:

> Moreover, Huntington states that five authorities on glaciation have concluded that if the mean temperature of the earth were to fall 9 degrees to 11 degrees F. and were to remain thus low for a sufficient length of time, meteorological conditions would be so altered that a large part of North America would be covered with ice down to about the fortieth degree of latitude and Europe would suffer a corresponding glaciation.[6]

This is not borne out by existing facts; the mean temperature of North America and Europe in the latitudes named is about 40° F. A reduction of from 9 to 11 degrees F. would bring the mean temperature of these regions down to about 30 degrees F. Portions of North America, Europe and Asia are now at or below this mean annual temperature, and have been under these general meteorological conditions for a long period in the past, and are not glaciated. Furthermore, it is found by all observers that the mean annual temperatures of Antarctic and Arctic regions are below this temperature, and that these regions are being deglaciated.[7]

It is difficult to accept deductions that North America and Europe down to 40° latitude would be reglaciated at a mean temperature higher than that now deglaciating Antarctica, unless the insolation

[2] p. 660.

[3] p. 662.

[4] Pub. 192, Carnegie Institution, p. 285, Fig. 266, p. 649; "Text-book of Geology." Pirsson and Schuchert, p. 431.

[5] p. 69.

[6] p. 663.

[7] SCIENCE, N. S. Vol. XLVI. Dec. 28, 1917, pp. 639–640.

were intercepted to a greater extent than at present. With no agreement whatever as to what the causes and conditions of glaciation are, it is not possible satisfactorily to predicate the conditions which would reglaciate any given region.

Summarizing the possible causes of glaciations, the above-quoted authors present the following:

Conclusions: Briefly, then, we may conclude that the markedly varying climates of the past seem to have been due primarily to periodic changes in the sun and in the topographic form of the earth's surface, plus variations of the amount of heat stored by the oceans. The transformed face of the earth altered the configuration of the continents and oceans, the air currents (moist or dry), the ocean currents (warm, mild or cool), and the volcanic ash content of the atmosphere. The causation for the warmer interglacial climates may lie in oscillations of solar energy.[8]

The members of this group of heterogeneous causes have individually been included in the unacceptable explanations given in the citations from page 660, and it is not shown that the group as a whole is any more acceptable than the individual causes which compose the whole.

Conceding that a transformed face of the earth would really alter the configuration of the continents and oceans, it must be also conceded that such transformations, at the close of long periods of crustal stability, would accelerate denudation of warm strata and the exposure and alteration of fresh radioactive materials, as well as expose new mountains reaching above the snow line of the period to glaciation. The appeal to oscillations of solar energy, when applied to warm interglacial periods of Permo-Carboniferous glaciation, during which genial conditions prevailed in polar latitudes, is, to say the least, not in harmony with the distributions of temperatures now maintained by solar energy, and can not readily be ascribed to oscillations of solar energy not accompanied by similar climatic oscillations elsewhere and particularly with the climatic anomalies of coincident polar geniality and subtropical glaciation.

These citations and the remarks thereon are not made in a spirit of adverse criticism, but to point out that what is now taught on the subject does not afford an adequate basis for an acceptable explanation of the admitted facts or even for a reasonable belief.

The student who would venture upon this sea of assumptions and of heterogeneous causes must embark in a ship whose center of gravity is above its meta-center. The deck-load of assumptions must be jettisoned and a ballast of facts and sound principles substituted therefor. A distribution of glaciation latitudinally ranging between the poles and the equatorial region appears to be contradictory of solar control and manifestly indicates that some essential factors have been overlooked or omitted in the consideration and presentation of the problems of paleoclimates; and that "other factors" must be utilized in place of those which have been strained beyond their limits of elasticity.[9]

This is the great outstanding problem of geologic history. It is of more importance and more far-reaching than any other, and geologists have turned their attention to the minor problems of mineralogy and paleobiology and have let the great problems of the causes and conditions of paleoclimatology fall by the wayside.

MARSDEN MANSON

BERKELEY, CALIF.

[8] p. 663. For relative constancy of solar energy see Curtis's address, SCIENCE, February 18, 1925, pp. 471–472.

[9] "Radio activity and earth history," Holmes, *Jour. of Geog.*, June, 1925, pp. 529–532.

WILLIAM ALBERT HAMILTON

WILLIAM ALBERT HAMILTON was born May 9, 1869, near Zanesville, Indiana. He died at Delaware, Ohio, June 25, 1925. He received his bachelor degree from Indiana University and his doctorate from the University of Chicago.

In 1902 he was called to Beloit College as professor of astronomy, and was later transferred to the headship of the department of mathematics. For twenty-one years Dr. Hamilton gave his best thought and service to the upbuilding of his department and to the support of Beloit College. He was an ideal teacher of mathematics, because he was precision and accuracy personified and he studied constantly to keep abreast of his developing science.

Dr. Hamilton was not willing to leave teaching for administrative work. Nevertheless, when Beloit College requested his assistance as recorder, registrar, director of the summer school and finally chairman of the administrative committee, which was to function during the interval of six months when Beloit College had no president, he consented to serve. In each and every administrative position he was an example of loyalty to high ideals, to unremitting toil and to sacrifice. This sacrifice became supreme when he severed his connection with Beloit College, which he had served for twenty-one years and into which he had put his best endeavors. He resigned because of the treatment accorded one of his intimate associates by the Board of Trustees at the commencement of 1923.

During the summer of 1923 Dr. Hamilton was

invited to join the faculties of Cornell University and the University of Wisconsin. He accepted the offered appointment of lecturer in mathematics at the University of Wisconsin, where he entered joyously again into advanced study and teaching.

Dr. Hamilton's scientific and educational associates may well testify that he was a man whose integrity of mind, purity of heart and unselfish devotion to truth and to worthy friends enrolled him among the truly great educators of his day and generation.

M. A. B.

SCIENTIFIC EVENTS

PALEONTOLOGICAL EXPEDITION OF THE FIELD MUSEUM TO ARGENTINA

THE Captain Field Paleontological Expedition to Argentina returned to Chicago in April, after twenty-six months in Argentina and Bolivia, having obtained three collections of fossils which should exemplify the orders of extinct mammals peculiar to that continent. The expedition was placed in charge of Elmer S. Riggs, associate curator of paleontology, assisted by G. F. Sternberg and J. B. Abbott, collectors, all members of the scientific staff of the Field Museum.

The labors of the expedition were begun in the Santa Cruzean formation at the southern extremity of Argentina. Immediately following the notable discoveries made by the *Beagle,* Captain Sullivan had observed and brought to the attention of English scientists the presence of fossil animals of strange forms in the cliffs about Cape Fairweather. Later researches of Argentine, and of American, paleontologists had made known the strange and interesting system of extinct mammalian life represented by fossils preserved in the rock-ledges of the Patagonian coast.

Employing the method of working from the better known to the less known, the Santa Cruzean Formation at Rio Gallegos was the first of a number of fields to be visited by the Field Museum Expedition. This formation, exposed in a line of cliffs rising 300 feet above tidewater and continuously undercut and eroded by the sea, proved to be a fertile, though an unusual, collecting ground. Fossils were found not only in the vertical wall of the sea-cliff, and in the fallen blocks below, but often in the ledges of sandstone exposed at low tide and extending a mile or more out to sea.

In this region, and among most hospitable, English-speaking sheep-growers, the work of the expedition was begun early in January, 1923. The remaining months of the southern summer enabled the collectors to work over one hundred miles or more of the coast ledges and to make a hurried excursion to the inland region of Lake Cardial. As a result, a valuable collection of nearly three hundred specimens of fossil mammals was secured from the Santa Cruzean Formation before the coming of winter made it necessary to suspend field operations.

The second summer's labors were begun with base at the oil port of Commodoro Rivadavia. In turn the expedition moved inland to Colonia Sarmiento and after a wide circuit returned to the coast at Puerto Deseado. A number of fossil-bearing localities, known and recorded by Argentina and foreign collectors, were visited. A wide reconnaissance in search of new collecting grounds was rewarded by some important discoveries.

The formation designated by Ameghino as Pyrotherium Beds and by American paleontologists as Deseado claimed especial attention. Its rich and varied fauna offered to the collector a most alluring promise. The gigantic and strange Pyrotherium, known to science for nearly forty years, still remains an object of conjecture and a problem in classification. The equally gigantic Parastrapotherium is little better known. Isolated jaws, teeth, tusks and scattered bones of these overlords of ancient Patagonia were found in considerable number, but their complete structure will remain almost as much a problem as before.

The animals of intermediate size and the lesser fauna of this formation yielded more generous returns. A collection of 250 specimens representing twenty-four genera of extinct mammals, together with a small number of birds and fishes, rewarded the expedition's labors. The discovery of two new localities for the occurrence of this fossil fauna and additional light on the geological formation may be added to the sum total of results. The Nothostylops Beds of Ameghino were examined, but only a small collection was secured from them.

The occurrence of fossil dinosaurs of great size was observed in a number of localities in the territories of Santa Cruz and of Chubut. A few specimens, the first known to have been taken out of Argentina, were collected. A fossil forest with stumps standing upright, logs lying prone, branches and fruitage scattered about was discovered. A considerable collection of specimens of these objects was made. Collections of modern plants and animals were also made from the territories of Chubut and Santa Cruz.

The southern winter months of 1924 were devoted to collecting pleistocene fossils in southern Bolivia. The Valley of Tarija, known for many years as a

fruitful collecting ground, was made the scene of these labors. A large collection, consisting of the great ground sloths, glyptodonts and armadillos, members of the horse, llama and elephant families, as well as many smaller animals, was secured.

Two of the collections made by this expedition have been received at the Field Museum. The third collection is expected soon. Plans are made for the expedition to return to South America at the end of the present year in order to complete the work planned. Special effort will be made to secure representative collections from the Pliocene formation; also to secure, so far as possible, specimens of the great pleistocene mammals from the Pampean region. The latter will be especially sought after because of their great size, unique characteristics and their consequent value as museum exhibits.

ELMER S. RIGGS
FIELD MUSEUM OF NATURAL HISTORY

THE WORLD POWER CONFERENCE

DISCUSSION of the form of permanent organization, determination of conditions under which regional meetings could be held and trial publication of a journal were, according to *The Electrical World*, the three principal matters that came up for discussion at the meeting in London on July 27 of the international executive committee of the World Power Conference.

Twenty countries were represented at the meeting. While no decision was arrived at as to the time and place for holding the next world conference, the consensus of opinion apparently was favorable to a meeting in 1930. The invitation of Italy has priority. If conditions at that time are comparable to those now existing, it is probable the conference will go to Rome, but the executive committee would not allow itself to be committed thus far in advance. Although the committee was unable to accept the invitation of Switzerland to call another world conference at Basle next year, provision was made for sectional meetings. A meeting of the European section will be called at Basle, and the international executive committee will meet there next year. This was satisfactory to the Swiss and will take care of similar situations when there is a demand for a conference in any one of the grand geographical divisions.

In submitting a form of permanent organization, the executive committee emphasized the desire to safeguard the conference in every way against becoming a superorganization. The whole desire is to work out a plan whereby the central organization will be the creature of the national committees.

It was regarded as so necessary to the attainment of the objectives of the conference to have a publication that it was decided to publish the *Journal of the World Power Conference* for one year, to give it a trial. During this trial period all expense of the effort will be borne by the British national committee.

AN INTERNATIONAL FORESTRY CONGRESS

BY agreement between the International Institute of Agriculture and the Italian Government a committee has been established for organizing a World's Forestry Congress to take place in Rome early in May, 1926. The headquarters of this committee are at the International Institute of Agriculture in Rome.

The congress will bring together experts in forestry and the timber and allied industries from all parts of the world, and it is hoped that truly valuable and profitable results will be reached through the exhaustive discussions, which are expected to take place on all those problems of forestry which are of really international importance.

At the same time, in connection with the International Fair at Milan, there will be held an important exhibition of forest products and the machinery used in their conversion, which will enable visitors to examine the different products of the wood manufacturing industries and the wood-working machines made in the various countries, and should serve to increase the flow of international trade in this important branch of commercial activity.

Various excursions to the more typical forest lands in Italy, and possibly in other countries, will be arranged to follow the work of the congress.

The congress is already arousing the warmest interest as it is considered to be one of the most important events in connection with forestry and the allied industries that has as yet taken place.

THE SOUTHAMPTON MEETING OF THE BRITISH ASSOCIATION

THE annual meeting of the British Association, held at Southampton from August 26 to September 2, was, according to press reports, a successful gathering. The visiting membership numbers between 1,200 and 1,300. Owing to the convenience of the meeting place for American visitors, a fair number were present. Neither Germany nor Russia were represented.

The president at the Southampton meeting, Professor Horace Lamb, in his address, which will be printed in the next issue of SCIENCE, dealt chiefly with certain branches of geophysics, particularly those relating to the physical construction of the earth. There are 13 sections of the association. In one of these, the Botany Section, a special forestry subsection has been formed this year in view of the proximity of the New Forest and the importance of Southampton as a timber importing place. Lord Lovat,

chairman of the Forestry Commission, attended a meeting of the subsection on August 28 and gave a review of the commissioners' work and of certain problems to be faced in the near future.

Mr. J. E. Barnard, whose name has lately been made famous by cancer research (in association with Dr. Gye) lectured in the Physiology Section on August 28 on "The microscopic observation of small bodies." Professor A. V. Hill, who is the president of the section, dealt in his address with "The physiological basis of athletic records."

Sir Archibald Denny presided over the Engineering Section and surveyed "Fifty years' evolution in naval architecture and marine engineering." Road and other transport problems were considered at joint meetings of the Engineering and Economics Sections on two days. Among the special aspects of the subject which were dealt with were the economics of highway engineering, the classification of roads and the economic significance of the development of road transport. Southampton is the headquarters of the Ordnance Survey, and the president of the Geography Section, Mr. A. R. Hinks, who is also president of the Royal Geographical Society, took map-making as the subject of his address. The president of the Zoology Section, Mr. Tate Regan, of the British Museum, spoke on organic evolution.

The Agriculture Section met jointly with the Economics Section to discuss agricultural costs and marketing. At a meeting of its own members it considered the place of cereal growing in British agriculture. Captain W. E. Elliot (parliamentary under-secretary for health, Scotland) was one of the contributors to the discussions of the section. The Education Section considered such topics as the training of teachers, diet and health. The president of the Economics Section was Miss L. Grier, principal of Lady Margaret Hall, Oxford, and her address was on "The meaning of wages." In the Botany Section Dame Helen Gwynne-Vaughan and other speakers discussed reproduction in plants.

Meteorology occupied a considerable place in the program of the section of Mathematics and Physical Science, where the president, Dr. G. C. Simpson, director of the Meteorological Office, spoke on new ideas in this field. A morning was given to the subject of wireless.

"Citizens' lectures" were arranged on wireless, broadcasting and flying, and there were special lectures to young people. The program of excursions included a visit, at the invitation of the Air Ministry, to the Calshot Aerodrome. It is the practice to arrange for selected students to attend the association meetings, and this year these numbered altogether about forty.

SCIENTIFIC NOTES AND NEWS

DR. CHARLES FREDERICK CHANDLER, emeritus professor of chemistry in the School of Mines, Columbia University, died on August 25, aged eighty-eight years.

DR. N. L. BRITTON, director of the New York Botanical Garden, was recently elected a fellow of the American Academy of Arts and Sciences.

W. D. JONES, of Jacksonville, Fla., was elected chairman, and Dr. Jacob Diner, of Fordham University, New York City, vice-chairman of the American Pharmaceutical Association, at its recent meeting in Des Moines.

AT the meeting of the Western Psychological Association held at Berkeley, on July 24 and 25, the following officers were elected for 1925–26: Professor W. R. Miles, Stanford University, *president;* Dr. Kate Gordon, the Southern Branch of the University of California, *vice-president;* Dr. Warner Brown, the University of California, *secretary.*

PROFESSOR J. BORDET, of Brussels, was recently given an honorary degree by the Toulouse medical faculty.

DR. ALDO CASTELLANI, director of tropical medicine and dermatology at the Ross Institute, London, has been elected a corresponding member of the Royal Academy of Medicine of Belgium.

THE council of the Royal Meteorological Society has awarded the Howard Prize for 1925 to H. W. Barnett, of South Africa, for the best essay on "Icebergs: their distribution and drift."

A BRONZE statue of Professor L. Mangiagalli, who has reached the academic age limit, was recently unveiled at Milan. The ceremonies concluded with a banquet.

D. A. CROCKER, vice-president in charge of woodlands of the Eastern Manufacturing Company, of Bangor, Maine, has been appointed forester in the woodlands section of the American Paper and Pulp Association, New York City.

DR. E. C. LEVY, professor of medicine at the Medical College of Virginia, has been appointed head of the Health Department at Tampa, Fla.

THE action of Secretary of Agriculture Jardine in naming Thomas P. Cooper, of Kentucky, as chief of the Bureau of Agricultural Economics in place of Dr. H. C. Taylor was followed by an announcement from President William C. Deming, of the Civil Service Commission, that Mr. Cooper must pass a civil service test. When officials of the Department of Agriculture were shown the Civil Service Commission's announce-

ment they said that Mr. Cooper, who is now dean of the College of Agriculture of the University of Kentucky, would submit to the required examination.

DR. C. F. JURITZ, chief of the division of chemistry of the Department of Agriculture of the Union of South Africa, is retiring, terminating a service of about thirty-five years.

AT the recent meeting of the International Congress of Roentgenologists in London, Professor Nemenov, director of the Leningrad Institute of Roentgenology and Radiology, was elected chairman.

THE Russian Geological Committee has received an invitation to attend the fourteenth International Geological Congress, which is to take place in Spain on June, 1926. Professor Samlilov will represent Russia at the congress.

PROFESSOR G. E. F. SHERWOOD, of the Southern Branch of the University of California, has been granted leave of absence for the next academic year, and will go to Cambridge, England, for study.

AMONG American scientific men who attended the recent meeting of the British Association for the Advancement of Science in Southampton are Dr. Vernon Kellogg, of the National Research Council, Professor Yandell Henderson and Professor W. F. G. Swann, of Yale University.

DR. CORNELIA CAREY, of Barnard College, Columbia University, has been working during June and July at the New Jersey Agricultural Experiment Station, New Brunswick, N. J. She is making a study of soil microbiological methods preparatory to undertaking investigations of soils in New York City and vicinity under the auspices of the Bronx Botanical Gardens and Columbia University.

PROFESSOR F. L. WASHBURN, of the University of Minnesota, who is collecting insects of Polynesia for that institution, is in Tahiti, on his way to the Tuamotus, the low atolls lying east of the Society Islands.

PROFESSOR MARK A. CARLETON, with the U. S. Department of Agriculture from 1894 to 1918, died recently in Peru, where he had gone some months previously in the service of a cotton growers' association, located at Piura.

DR. R. MARTIN, professor of anthropology at Munich and a pioneer in anthropometric calculations, has died.

G. M. MURGOCI, chief of the agrogeological section of the Geological Institute of Rumania and professor in the Polytechnic School of Bucharest, died on March 5 at the age of 53 years. He was president of the International Commission on Soil Mapping and director of the International Pedological Charts of Europe.

THE Civil Service Commission has announced open competitive examinations to fill vacancies in the following positions: Associate agricultural economist (agricultural history) at $3,000 a year, associate agricultural economist (farm finance) at $3,000 a year, Bureau of Agricultural Economics, Department of Agriculture, for duty in Washington, D. C., or in the field. Chief social service worker (psychiatric), Veterans' Bureau, Washington, D. C., at $3,000 a year. Under scientific helper, experiment station of the Bureau of Mines, Pittsburgh, Pa., and the chemical laboratory of the Bureau of Internal Revenue, Buffalo, N. Y., at $1,140 a year. This examination is also to fill vacancies in the District of Columbia, at an entrance salary of $1,140 a year and for junior metallurgist, Frankford Arsenal, Philadelphia, Pa., at $1,920 to $2,040 a year.

THE All-Ukrainian Geophysical Congress has been concluded at Kiev. Papers were read on the condition of meteorology in the Republics of the Soviet Union, on the study of solar energy, on the importance of meteorology to agriculture and railway work. It was resolved to organize at the meteorological stations additional observations, with a view to agriculture, of the continuity and intensity of the solar influence, of the evaporation of water, of the distribution of temperature in the soil, of rain and hail-storms, etc. The congress appealed to Polish and Rumanian scientific institutions to communicate their respective observations on the upper courses of the Pripyat and Dniester Rivers.

THE Missouri Forestry Association has raised by public subscription a fund which now exceeds $22,000. The larger part of this will be used to give effect to the forestry law passed by the last general assembly, the appropriation provided for this purpose having been vetoed by Governor Baker as a measure of economy. A portion has been paid to the University of Missouri to enable that institution to engage in extension work in forestry in cooperation with the federal government under the provisions of the Clarke-McNary law. Frederick Dunlap, of Columbia, who has served as secretary of the Missouri Forestry Association while engaged in the private practice of forestry, has been appointed state forester as well as extension forester and for the present will have charge of both lines of activity.

A GIFT of $245,000 to the University of Minnesota has been made by the Laura Spelman Rockefeller Memorial for the establishment of an institute for child welfare. The gift will be available at the rate

of $49,000 a year for five years. A home will be established to which a small number of infants may be sent, and a nursery school for children up to five years of age. The institute will study the development of habits, means of bettering child health, methods of instructing children and the most normal reactions to environment.

SIGNATURES of the governor of Illinois and the governor of Wisconsin have been affixed to the final state enabling acts necessary to the establishment by the Federal Government of the upper Mississippi River wild life and fish refuge. Purchase of the first tracts of the refuge, which covers some 345,000 acres of bottom lands from Rock Island, Ill., to Wabasha, Minn., is expected to be started at once. A total federal appropriation of $1,500,000 has been authorized, of which $400,000 is now available.

FREE illustrated lectures on natural history are to be given by the Field Museum of Natural History this fall in the public schools of Chicago and in the museum. The income from a trust fund of $300,000 just presented the trustees by Mrs. James Nelson Raymond makes the course possible.

A SUM of 160,000,000 gold rubles, or approximately $80,000,000, is included in the budget of the Soviet Union for 1925–26 for the carrying out of an extensive plan for electrical development, according to K. P. Lovin, chairman, and B. A. Barsukov, manager of the technical department of the Moscow Combination of State Electrical Stations, who are in this country for a three months' study of power development and electrical machinery. The ultimate development for the Soviet Union will include thirty stations with a combined capacity of 1,750,000 kw.

IN conformity with resolution number 8 passed at the Madrid meeting of the International Section of Terrestrial Magnetism and Electricity, the Danish government will establish this summer a magnetic observatory, near Godhavn, Greenland. It is hoped later to include atmospheric-electric observations.

THE *Aften Posten* of Oslo, Norway, states that Captain Roald Amundsen since his arrival home from his recently attempted flight to the North Pole has been preparing a new airplane expedition for next summer, from Spitzbergen over the Pole and unknown Arctic regions to Alaska. The newspaper states that financial backing has been assured and that the expedition will include Lincoln Ellsworth, the American who was with Amundsen's party this summer. It is stated that the Dornier Company will build an airplane larger than the N-25 which Amundsen's party saved from the Arctic this year and that the new machine will be equipped with many improvements resulting from experience gained during the recent expedition.

THE Harvard College Observatory has received a cable from the Central Bureau of Astronomical Telegrams at Copenhagen announcing the rediscovery on Aug. 14 by Dr. A. Schaumasse, of the observatory at Nice, France, of the Borelly Comet. This comet was first discovered in 1889 at Marseilles and has a period of approximately seven years. It was last rediscovered by Fayet at Nice in 1918. The detailed observation by Dr. Shaumasse was ascension 5 hours, 4 minutes, 24 seconds; declination north 2 degrees, 4 minutes, the comet being of the thirteenth magnitude. This return, as announced, is within one degree of the place predicted by Dr. Crommelin, of the Greenwich Observatory.

THE Exposition of Chemical Industries will be held from September 28 to October 3 in the Grand Central Palace, New York City. Last year this exposition was not held. It is expected that the 1925 exposition will offer more to chemists and chemical engineers in the line of new equipment, new methods and new materials than any previous exposition. Aside from the regular exhibits, the management this year plans some new features which should add to the attractiveness of the event for those who are interested in chemistry and chemical progress. One of these, known as the "Court of achievement," has been worked out in cooperation with a committee representing the American Chemical Society. In this court outstanding achievements in chemistry, either in research or in industry, will be featured. A series of lectures by outstanding men in the chemical industry of the country is planned. These lecturers will cover almost the entire field of chemical industry and should be of considerable interest to those who wish to keep abreast with the developments in the various industries.

THE Royal College of Surgeons has decided to admit women on the same terms and under the same conditions as men. Heretofore they have been admitted as fellows and members, but without the right to vote for the council, which is the executive body. In the future women also will be eligible for seats on the council. There are at present thirteen women fellows and members.

IT is proposed to establish in England a British Institute of Radio Engineers. According to a letter to the London *Times* from Mr. Y. W. P. Evans, it is felt that with the rapid advance of radio science a great advantage is to be gained by the formation of an association which will concentrate on the purely technical radio problems which arise from time to time. The constitution of the proposed association will be

strictly confined to members whose radio knowledge is beyond question, and every effort will be made to keep the standard of efficiency as high as possible.

ACCORDING to the annual report of the British Museum the total number of visitors to the Natural History Museum during 1924 was 521,901, the largest since 1920, and an increase of 29,401 as compared with 1923. The attendance on Sunday afternoons, the highest recorded since the institution of Sunday opening in 1896, was 84,844, as against 72,931 in the previous year. The museum specialists continued to advise on a great variety of economic problems referred to them. Inquiries dealt with by the department of entomology included many relating to the cotton boll weevil and the pink boll worm, which cause enormous damage to cotton crops. The report states that knowledge as to the extent of the ravages of these pests seems to have been spread considerably through the British Empire Exhibition.

UNIVERSITY AND EDUCATIONAL NOTES

MRS. ANNA RAYMOND has given $100,000 to the University of Chicago to establish a James Nelson and Anna Louise Raymond professorship in the School of Medicine. The subject in which the professorship is to be established is left to the discretion of the trustees.

CONSTRUCTION is to be started at once on a new wing to the main building of the University of Wisconsin, to cost $470,000. This sum was recently appropriated by the state legislature.

THE vice-chancellor of the University of Cambridge has announced that the Board of Trade has approved of the Joint Coal Mining Diploma granted by the Universities of Cambridge and Birmingham on satisfactory completion of their joint course in science and coal mining.

DR. J. H. HANCE, assistant chief of the Illinois Geological Survey, has been appointed head of the department of geology at the Texas Agricultural and Mechanical College.

DR. THOMAS G. PHILLIPS, professor of agricultural chemistry at the Ohio State University, has been appointed professor of agricultural chemistry and chemist in the New Hampshire University and Experiment Station.

EARL B. SMITH, who for the past nine years has been in charge of the engineering and research laboratories of the United States Bureau of Public Roads, has resigned to become professor of mechanical engineering at the Iowa State College.

DR. ROBERT M. ISENBERGER has been appointed associate professor in the department of physiology and pharmacology at the University of Kansas School of Medicine.

DR. CHARLES DALE BEERS, of the Johns Hopkins University, and Dr. Harold Kirby, Jr., of the University of California, have been appointed instructors in biology at Yale University.

DR. ROBERT L. PENDLETON, director of agriculture in Gwalior State, India, has been appointed professor of soil technology at the University of the Philippines and in charge of the work in soils in the department of agronomy.

DR. G. M. SHRUM, who has been associated with the low temperature laboratory at the University of Toronto since its inception, has been appointed assistant professor in physics at the University of British Columbia, Vancouver.

PROFESSOR GUSTAV HERGLOTZ, of the University of Leipzig, has been appointed professor of mathematics at the University of Göttingen.

DISCUSSION AND CORRESPONDENCE

DR. W. D. RILEY ON EVOLUTION

PRIOR to listening to a debate upon evolution I was moved to wonder just what an anti-evolutionist would have to talk about, and since many readers of SCIENCE must be in a like frame of mind I should like to report briefly upon the debate between Dr. Riley, representative of the Christian Fundamentalists, and Dr. Cantrell, of the Science League of America. The debate, which occurred at the Armory at Eugene, on July 9, was one of a series between the two men which took place in various cities on the Pacific coast. This article is based upon notes taken at the time, and upon my memory of the proceedings. I have checked my statements by submitting them to others who attended the meeting. I was seated where I could simultaneously see both the speaker and the larger part of the audience.

Dr. Riley represented himself as a lover of science and of verified knowledge. He maintained, however, that the fundamentalist was the true scientist, the so-called scientists being unworthy of the title. There was a difference between the fundamentalist and the so-called scientist, which Dr. Riley felt himself called upon to sturdily proclaim. The doctrine of evolution was unscientific because it was a theory. Huxley and Darwin had both called it such. Evolution presupposed that one species came from another. This idea Dr. Riley "held to scorn." "Every species," he continued, "produces after its kind." After some extension of this idea Dr. Riley related an anecdote of a personal meeting, on a train, with a young instructor

in biology, who had attempted to defend evolution, and who, after being led to her undoing by means of appropriate questions, was utterly discomfited. The audience received the account of this episode with ill-restrained hilarity.

Dr. Riley dwelt to a considerable extent upon the reluctance of Dubois to permit any one to view the remains of Pithecanthropus. From his remarks I would have obtained, did I know no better, the impression that nobody but Dubois had examined the fossils, although I do not think that Dr. Riley stated that that was the case. Dr. Riley then read excerpts from Van Loon's "Story of Mankind," which he represented as a typical book upon evolution, used as a text in certain schools. He interpolated jocular remarks of his (Dr. Riley's) own as he read. Then for comparison, although without the jocular interpolations, he read the account of creation from Genesis. With the account of the creation of man in the image of the Creator ringing in their ears, he left it to his hearers to choose the account they preferred.

Dr. Cantrell took up some of the evidences of inorganic evolution, outlined the evidence from paleontology and dwelt upon the evidence offered by embryological development. He found his audience attentive but unsympathetic, and, in my opinion, he made little headway in getting in touch with them. I should judge that most of his points were lost because his hearers failed to understand what the argument was about. I was impressed with the energy he displayed after having spoken to a succession of rather hostile crowds.

In spite of its rather unsympathetic reception, Dr. Riley attempted to refute Cantrell's evidence from paleontology. He pooh-poohed the claim of definite age for any fossil by pointing out that it could be buried to or sink to the required position. He felt that the tail and teeth of Archaeopteryx were merely one of the creative acts. Dr. Riley then related an anecdote of a dentist who had sent an abnormal tooth to eleven scientists (not named) all of whom had unhesitatingly pronounced it as having come from a huge primitive man. When Dr. Riley divulged the fact that the tooth had been extracted from a little ninety-pound woman, the audience rolled in ecstasy. Dr. Riley also related a story about a tail-rapping dog whose ostensible omniscience had fooled all the scientists. These men, Dr. Riley pointed out, rejected divine revelation, while accepting the message from the tail of a dog!

Seemingly stung a little by Cantrell's charge of inconsistency in the literal account of creation in Genesis, Dr. Riley (*mirabile dictu*) declared that there was "no inharmony between Genesis and geology." He bolstered up this assertion by the remark that the Bible mentions the early creation of "grasses," while it is a well-known fact that the algae were one of the first forms of life! Perhaps the choicest thing of the evening was, however, Dr. Riley's attempted rebuttal of Cantrell's statement that any new idea is subjected to opposition. Cantrell had specifically mentioned railroads. Whereupon Dr. Riley read a passage from the Bible purporting to be a biblical prophecy of railroads! This finesse in rebuttal brought about, in his adherents, a jubilation bordering upon frenzy.

A standing vote of the audience, in the proportion of about ten to one, upheld the resolution that the doctrine of evolution was a fallacy, and should not be taught in the public schools of America. I made no count of the number of people attending, but I would estimate the number to have been about five hundred.

This mixture of misrepresentation, irrelevance and inconsistency was the case against evolution as propounded by a man advertised as being a prominent fundamentalist. These and similar "arguments" may well bring about, in Oregon and other states, laws which forbid the teaching of evolution in the tax-supported schools. People who sit and applaud such puerilities have a lot to learn. Scientists who find themselves, at such a time, out of touch with and therefore distrusted by the mass of the people, with their capital tied up in a position their tenure of which is subject to the caprice or fears of those in authority, may, in my opinion, take certain lessons to heart also.

R. R. HUESTIS
UNIVERSITY OF OREGON

THE SCIENCE LEAGUE OF AMERICA

WILL you permit me to answer briefly Mr. Cardiff's letter in the issue of SCIENCE for July 31?

The Science League of America was founded in San Francisco last September, for the specific purpose of protecting the teaching of evolution in tax-supported schools and colleges, and of preventing any attempt at a union of church and state by the fundamentalists. It has never claimed any connection with the American Association for the Advancement of Science and the only newspaper item we ever saw making such a mistake was corrected in a two-column editorial.

Nevertheless, the vast majority of our members (including the president and founder) are members of the American Association. We have just completed formation of a national advisory board almost exclusively made up of eminent scientists, members and in many cases fellows of the A. A. A. S. Our relations with the society have been most friendly, and I should like to have the American Association regard us as

an unofficial auxiliary agent by which the provisions of its committee on freedom of science teaching (several members of which are also members of the Science League) may be carried out. Our activities in this direction have been hampered by lack of adequate financial support, but we have already accomplished a good deal.

Mr. Cantrell was sent north as an emergency substitute when I became ill in the course of a series of debates with Dr. Riley, executive secretary of the World's Christian Fundamentalist Association. These debates were arranged for the purpose of proving to the enlightened portion of the populace the strength and menace of fundamentalism on the Pacific Coast; and having achieved this object, no more will be held under our auspices.

I can not believe that Mr. Cantrell made any attempt to reconcile the Bible with evolution, and from my long acquaintance with him I am sure that any newspaper statements to this effect were misrepresentations. We have made every effort in all our spoken and written utterances not to touch on this point, and to approach the question purely from the standpoint of the scientific validity of the theory of evolution and the necessity of preserving the freedom of teachers to make known the findings of science.

Incidentally, I may say that our unwillingness to argue such reconciliation has been the means of losing us many members—notably members of the American Association for the Advancement of Science. For one letter we have received taking the viewpoint of Mr. Cardiff, we have had ten insisting that we come out openly for the reconcilement of Genesis and evolution. This we have not done and shall not do, which makes Mr. Cardiff's attack all the more unfair.

A failure to present our reply to his attack would not only mark an irreparable harm to the Science League, which, poorly supported and against tremendous odds, has struggled for a year to build up a working organization against the fundamentalist attacks on freedom in science teaching; but would also injure materially the whole defense of the teaching of evolution, especially on the Pacific Coast, where the situation is already acute and is daily becoming more so. We are now organized formally in several cities, and have a membership-at-large of scientists and educated laymen in 42 states, D. C. and Hawaii, and in the faculties of 49 colleges and universities. We are just beginning to get to the organization and actively educational stage, and we need the help and the informed counsel of every member of the American Association for the Advancement of Science. In fairness to us and to the cause we represent, will you not be good enough to publish this letter in SCIENCE?

MAYNARD SHIPLEY, *President*

THE NAME N IN COS NT

REFERRING to note under this title in SCIENCE for June 5, the writer wishes to make another suggestion. Since the equation is usually used in physics and engineering to represent harmonic motion of some kind, and the term NT represents the phase of the oscillation, it is seen that the coefficient N represents the radians of phase passed through in unit time. It seems that "phase velocity" would be a phrase that would be nearly self-explanatory and does not lend itself to the criticism of using an old term in a new sense, as would be the case if we adopted the terms, *speed, rapidity, frequency* or *pulsation,* which are already established with other and definite meanings. It appears to the writer that *circular frequency, pulsatance* and *π-frequency* do not convey as much intrinsic meaning as "phase velocity" and are thus less suited from the teacher's standpoint. The fundamental unit of phase is the radian, and time, the second, so the natural unit of phase velocity would be radians per second, entirely in keeping with its use in the expression cos NT. The writer has used the above expression for a number of years in courses in Electrical Engineering and has found no difficulty on the part of the students in grasping the meaning of the expression.

JESSE L. BRENNEMAN
KANSAS STATE AGRICULTURAL COLLEGE

PROFESSOR ROBINSON'S TRIBUTE TO ASA GRAY

THE tribute to Asa Gray in the July 17, 1925, issue of SCIENCE struck a responsive chord in my heart.

It was my good fortune to meet Asa Gray the first time at a meeting of the American Association for the Advancement of Science, at Dubuque, I think, in 1872. I went to Dubuque to report the meeting for the *Indianapolis Journal.* I, of course, was interested in science and was a member of the association, but this was the first meeting I had ever attended.

During this meeting we had an excursion up the river. A large party of scientific men was walking along the bank, among them Asa Gray. We came across a pool of still water connected with the river, in which there were some beautiful water lilies, very large. Professor Gray pointed to a mass of flowers which were particularly beautiful, growing near the edge, but too far from shore to be reached, and expressed a desire to possess them. I, at that time, was not afraid of getting wet, so I plunged into the pool, plucked the lilies and presented them to him. He expressed to me his very great joy in having them.

I think that this meeting with Asa Gray was the deciding factor in my going to Harvard the next year for a special course in chemistry. Professor Gray be-

longed to that group of great men mentioned by Professor Robinson, composed of Longfellow, Norton, Agassiz, James Russell Lowell and Oliver Wendell Holmes. It was my good fortune within a year or two of my meeting with Asa Gray to meet all these worthies. I greatly appreciate the tribute paid to Asa Gray by Professor Robinson.

H. W. WILEY

QUOTATIONS

INTELLECTUAL LEADERSHIP OF THE TIMES, THE POST AND THE TRANSCRIPT

Wireless to the New York Times, August 26, and printed on the front page.

PROFESSOR CHARLES HENRY of the Sorbonne [Minerva does not record a Professor Charles Henry at the Sorbonne or elsewhere], one of the leading mathematicians of France, declared that he had proof of the scientific, mathematical certainty that "nobody dies entirely."

"That 'something' which is called a soul continues to radiate," he said, and, referring to the belief of some that when a man is dead he is dead forever, buried, finished and not to be talked of any more, he continued:

"What a mistake is theirs! In order to recognize their error it is necessary only to carry out certain experiments accessible to anybody knowing how to manipulate the essential apparatus 'ad hoc.' The apparatus exists."

Saying religions had sought to explain the phenomenon of death and to promise the infinite prolongation of life, Professor Henry went on:

"But I have acquired a certitude, and that by purely scientific methods, that the originators of these religions were in reality the precursors of science possessed by intuition of the truth.

"Among scientists there are means for measuring the radiation of all substances—for every substance body emanates radiation. Your lamp, your stove, your cherry tree are warmed by the sun's rays.

"Calculate that radiation which is due to heat, due to electro-magnetic elements and due to the attraction of our globe. If you make the calculations conscientiously you will with anguished surprise find yourself up against something unknown, some force which is neither one nor the other of these."

Associated Press dispatch printed on the front page of the New York Evening Post, August 21.

Sound waves from a human brain have been picked up by a radio receiver on a four to ten meter wave length.

The experiment is described by Professor Ferdinando Cazzamali [Minerva does not record a Professor Cazzamali at Milan or elsewhere], heard of the department of neurology and psychiatry at the University of Milan, in an article prepared for the forthcoming issue of *Revue de Metphysique.*

As a result Professor Cazzamali foresees the transmission of sound waves from one brain to another.

He says he operated with highly excited persons or those suffering from nervous diseases as well as the noted Italian medium, Signora Maggi. The patient was shut up in a perfectly insulated cabinet.

The sounds he heard through the receiver ranged from signals akin to ordinary wireless signals to whistling and soft violin or cello notes.

Similar results were obtained, he declares, from persons under hypnosis. In every case, however, the emanations stopped when the subject resumed a normal and peaceful frame of mind.

From an editorial article in the Boston Evening Transcript, August 21.

Science has performed so many wonders that it sometimes presumes on achievement that is far beyond its reach. But fundamentally there seems to be no fact that militates against the Milan professor's theory, to say the least. That the "wave theory" governs or applies to the nervous impulses, or the cerebral control over the nervous centers, is altogether likely. What may eventually be done in the way of measuring, determining or controlling the "waves" of the brain no one can say in the present state of knowledge.

The suggestion that the brain impulses may thus be harnessed and coded like wireless telegraphy is a startling one. It seems to foreshadow not only a wonderful means of communication, but also the removal of the veil that hangs in front of the operations of the human mind. Conceivably it projects our race into a Palace of Truth, where each individual may read the thoughts of his neighbor. It unfolds to our gaze a rather uncomfortable world. It seems to make a goldfish in a globe out of every human being. Somehow one rather hopes that the complete development of Professor Cazzamali's discovery—if there is anything in it—will be left to the next generation.

SCIENTIFIC BOOKS

Medicine, An Historical Outline. By MAJOR M. G. SEELIG. Baltimore: Williams and Wilkins.

A CHARMINGLY characteristic foreword by Lieutenant Colonel F. H. Garrison precedes this work of Seelig's, which consists of eight lectures which were delivered at the Washington University in St. Louis.

These discourses were given with the aim of interesting the senior students of the medical school in the all-important but very much neglected subject of the history of medicine. With this as their aim it is quite sure they succeeded and it is indeed gratifying that there is an ever-increasing number of publications dealing with the past of this noble profession of medicine. The book is most readable and is well illustrated with forty-eight half tones, portraits of some of the masters of medicine. It could hardly fail to awaken the student unless he were entirely anesthetic to the subject.

Unfortunately Major Seelig did not go over his manuscript very carefully before publishing it, else he had not allowed so many errors to remain. The dates of the founding of the various universities are not in accord with the best authorities and the school of Salerno is referred to as a university. John Locke is placed in with the lights of the eighteenth century, when his dates are 1632–1704. Glibly he speaks of a group of English surgeons of the early nineteenth century as being familiar to American surgeons and almost of yesteryear. It would be interesting to know how many American surgeons could tell what Aston Key, Benjamin Travers, William Ferguson and James Wardrop did. They might make out better with the remainder of those mentioned—Astley Cooper, John Bell, James Syme, Robert Liston and Benjamin Brodie.

As we remarked before, the aim of the lectures is to be commended and those who listened to them of course caught the inspiration which was what was intended, but before being put into cold type they should have had careful revision.

JOHN RUHRÄH

BALTIMORE

SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE PRODUCTION OF PURE ABSOLUTE ALCOHOL WITH CALCIUM CARBIDE AND ANHYDROUS COPPER SULPHATE

EACH of the best known of the various processes, as described in the literature[1-8] for producing absolute alcohol on a laboratory scale from 94 to 95 per cent. alcohol presents one or more disadvantages, namely, expense of materials, time consumed, low yield or poor quality of product.

The use of calcium carbide as an alcohol dehydrating agent was proposed by Yvon.[2] Approximately the first third of the distillate obtained under the conditions given contained acetylene. Ostermayer[2] reports the successful production of absolute alcohol by the Yvon procedure, but emphasizes the difficult removal of the bad odor and taste of the distillate, due to organic sulphur compounds. These objectionable characteristics of the 100 per cent. alcohol so obtained have discouraged or prevented the use of calcium carbide as an alcohol dehydrating agent.

The authors have made an experimental study of the operation for the purpose of increasing the yield of 100 per cent. alcohol, reducing both the time and the quantity of carbide, and finding satisfactory means of removing the acetylene, organic sulphur and phosphorus compounds which are retained by alcohol when treated as Yvon directs.

The data from the following experiment will indicate the procedure and the conditions found most satisfactory:

Experiment III: To 100 gr. (92.34 wt. per cent., 95.02 vol. per cent., alcohol, contained in a flask attached to a reflux condenser, were added 17.5 gr. of granular, −20 mesh, calcium carbide (81.1 per cent. pure CaC_2). The alcohol was maintained at boiling temperature on a water bath for thirty minutes, then 0.5–1.0 gr. of anhydrous copper sulphate was added, to engage the dissolved acetylene and sulphur compounds. Boiling under the reflux condenser was continued for fifteen minutes and the alcohol then distilled off.

Total distillate = 93.74 gr. or 98.66 per cent. of the theoretical yield. The specific gravity at 15 degrees C. = .7945 or 99.86 vol. per cent. alcohol, of normal odor and taste, and negative to tests for acetylene with Cu_2Cl_2, sulphur compounds, aldehyde and free acid.

Qualitative tests for water in the alcoholic distillates were made with anhydrous copper sulphate, crystalline potassium permanganate and calcium carbide to determine the comparative delicacy of the reagents.

Anhydrous $CuSO_4$ is not nearly so delicate nor is a positive reaction as quickly obtained with it as with either of the other two. Potassium permanganate crystals showed faint pink after five minutes in 99.57 per cent alcohol—no color in 99.63 alcohol.

[1] Mendeleeff, Ann. Phys. Chem. 1869, ii, 138, 230.

[2] Yvon, Compt. rend. 1897, 125, 1881–2. Ostermayer, C. Bl. 1898, I. 658. Pharm. Ztg. 43, 99 9/2.

[3] Kailan, Monatsch. 1907, 28, 927.

[4] Winkler, Ber. 1905, 38, 3612–16.

[5] Plucker, Zeit. Nahr u. Genussm. 1919, 17, 454–8.

[6] Pozzi, Escat. Bull. Assoc. Chim. Sucr. Dict. 1909, 26, 580.

[7] Chavanne, Bull. Soc. Chim. Belg. 1813, 27, 205.

[8] Young, Trans. Chem. Soc. 1902, 81, 707 and 717.

Powdered calcium carbide in 99.63 alcohol yielded visible gas bubbles[9] after a few seconds, while $KmnO_4$ crystals showed no color after five minutes.

SUMMARY

(1) The above is recommended as an economical, convenient and quick method for producing absolute alcohol on a laboratory scale.

If the distillation is executed with free flame, excessive or careless heating must be avoided near the end of the operation because of the copper acetylide in the residue.

(2) Calcium carbide is recommended over potassium permanganate or anhydrous copper sulphate as a qualitative reagent in detecting traces of water in alcohol.

R. E. LYONS
L. T. SMITH

INDIANA UNIVERSITY

SPECIAL ARTICLES

MANOILOV'S REACTION FOR IDENTIFICATION OF THE SEXES[1]

IN a recent number of the *Russian Bulletin for Applied Botany and Plantbreeding* two papers[2] were published dealing with a problem which may have a great influence on the further development of studies on the physiology of sex. Since these papers deal with a subject in which many biologists are interested and since they are published in a periodical and language not very accessible to most of them it seems to us justifiable to give a short review of those papers and at the same time to present our tests of Dr. Manoilov's method.

Dr. Manoilov found a reaction[3] by which it is possible to distinguish female blood from male. The following reagents were used:

(1) 1 per cent. solution of Papayotin in water.
(2) 1 per cent. solution of Dahlia or Grübler's methyl-green in alcohol.
(3) 1 per cent. solution of potassium permanganate in water.
(4) 40 per cent. solution of HCl.
(5) 2 per cent. solution of thiosinamin in water.

To 3 cc of 10 to 20 per cent. blood 10 drops of the first solution were added, after one or two minutes 3 drops of the second solution, then 10 drops of the third, 1 to 3 drops of the fourth and 5 drops of the fifth solution were added. After additions of the first, second and third solutions the material has to be stirred (not shaken), and after the addition of the fourth and fifth reagents it has to be shaken. The male blood soon becomes colorless or nearly so, while female blood retains its reddish-violet color.

Dr. Manoilov is inclined to believe that hemoglobin is responsible for the differential male and female reactions he obtained, and since chlorophyll is chemically closely related to hemoglobin he tried to see if the same reaction would occur in dioecious plants. An alcoholic extract of chlorophyll from leaves was made by letting 10g of leaves stand for two hours in 30 cc of 60 per cent. alcohol. To 3 cc of that extract the same reagents were added in the way described above. Positive results were obtained, *e.g.*, solutions from male plants became colorless and those from female plants retained the color. Experiments were made with Acer negundo, Lychnis dioica, Vallisneria, Urtica and Cannabis, all giving the same results.

Grünberg tested Manoilov's method on the following plants: Vallisneria sp, Urtica dioica, Cannabis sativa, Populus sp, Hippophae rhamnoides, Eucephialartos villosus, E. longifolius and Begonia sp. Especially interesting results were obtained with monoecious Begonia: male flowers gave the characteristic male reactions, female flowers gave the female reaction and the leaves an intermediate one. The experiments of Grünberg showed that the presence of chlorophyll is not essential for the reaction to occur. This was confirmed by the results of investigations conducted by Minenkov[4] who obtained differential sexual reaction using seed and young seedlings of dioecious plants. Minenkov's method, however, was entirely different from that used by Manoilov.

Experiments to test Manoilov's method are being made by the authors, and positive results have been obtained with the following organisms:

[9] The calcium carbide used in a qualitative test should be freed from occluded air, as this, when alcohol is added, will give air bubbles which may be mistaken for acetylene gas bubbles. The discharge of occluded air will cease within a few seconds; the generation of acetylene, if water is present, will continue for a time.

[1] Research carried on with the aid of a grant from the committee for research in problems of sex of the National Research Council.

[2] Manoilov, E. O., "Identification of the sexes in dioecious plants by chemical reaction." *Bul. Appl. Bot. and Plantbreed.* 13(2): 503–505. 1922–1923.

Grünberg, O., An addition to the paper of Dr. Manoilov: "Identification of the sexes in dioecious plants by chemical reaction." *Bul. Appl. Bot. and Plantbreed.* 13(2): 506. 1922–1923 (Both in Russian).

[3] Manoilov's paper describing the method which he used in experiments with animals was published in *Vratschebnaja Gazeta* (*Medical Gazette*) No. 15, 1923. Unfortunately, it has not been possible for us as yet to obtain this paper.

[4] Minenkov, A., *Nautschno Agronomitscheskii Zurnal* (*Jour. Sci. Agr.*), Vol. 1, 1924.

Part of the organism used	Number of individuals tested ♀	♂
Mice	blood	12	9
Sheep	blood	2	2
Pigeon	blood serum	3	3
Fruit flies (Drosophila virilis)	.5–1.5 g. of flies	2	2
Cladocera sp.	.2 g. of animals	3	2
Salix sp.	catkins	5	7
Populus sp.	catkins	2	6

It may be noted that the reaction is very sensitive. A slight mistake in the method or fault in the material may give inconclusive results. It should be mentioned that nine more male mice than these previously listed were used in investigations. Six of them gave inconclusive results and with the other three a reaction was obtained which was classified as female. It is very likely that in those cases, due to our unfamiliarity with technic, reacting enzymes were destroyed and the expected reaction failed to occur.

As pointed out by Manoilov in making the chlorophyll extract, it is essential not to have alcohol stronger than 60 per cent. and not to leave the material in alcohol over 24 hours. Otherwise the enzymes which produce the reaction are likely to be destroyed.

The authors are indebted to Dr. C. B. Davenport for mice and sheep material, to Dr. A. M. Banta for Cladoceras and to Dr. O. Riddle for pigeon material.

SOPHIA SATINA
M. DEMEREC

DEPARTMENT OF GENETICS
CARNEGIE INSTITUTION OF WASHINGTON
COLD SPRING HARBOR, N. Y.

HYDROGEN-MAGNESIUM HALIDES[1]

THE intermediate formation of hydrogen-magnesium halides is postulated in current theories to account for the reducing action of the Grignard reagent on the carbonyl linkage. Several attempts have been made to prepare such compounds: first, the action of hydrogen halides on magnesium at low temperatures; second, the heating of sec-butylmagnesium bromide at 150° in a high vacuum, and, third, the catalytic reduction of RMgX compounds. Catalytic reduction of triphenylmethyl-magnesium chloride gave results which are indicative of the formation of hydrogen-magnesium chloride.

The reaction of RMgX compounds with azo compounds and the formation of colored intermediate compounds when the Grignard reagent reacts with carbonyl compounds suggests the intermediate formation of magnesium halides analogous to the metal ketyls. The free radical (R) so formed then dissociates to give hydrogen and the corresponding unsaturated compound. This hydrogen then combines with the trivalent carbon.

RUSSELL M. PICKENS

[1] Abstract of a paper presented before the meeting of the American Chemical Society at Baltimore.

THE AMERICAN CHEMICAL SOCIETY[1]

The use of the sodium salt of dimethylglyoxime for the qualitative and quantitative determination of nickel: WALDO L. SEMON and GILBERT SWART. Dimethylglyoxime forms a crystalline hydrated sodium salt. It is extremely soluble in water and insoluble in alcohol. A 3 per cent. (0.1M) *aqueous* solution is recommended for use in qualitative and quantitative analysis to replace the 1 per cent. alcoholic solution of dimethylglyoxime. Analyses for Ni are given in the presence of Co, Cr, Mn, Zn and Fe and in various alloy steels.

Esters of 3-amino-4-hydroxymethyl-benzoic acid: FRANCIS H. CASE. Ethyl 3-amino-4-hydroxymethyl-benzoate is prepared as follows: p-cyanobenzyl chloride is nitrated, and the 3-nitro-4-chloromethyl-benzonitrile converted to the acetate. This compound on hydrolysis with alcoholic hydrogen chloride yields ethyl 3-nitro-4-hydroxymethyl-benzoate. The latter is reduced to the amino ester by tin and alcoholic hydrogen chloride. Better yields were obtained with colloidal platinum in acetic acid solution. The butyl amino ester is similarly prepared from the butyl nitro ester. The hydrochlorides are soluble in water. The local anesthetic action of these esters will be investigated. A simple method of preparing p-chloromethyl benzoic acid has been found, in which the corresponding nitrile is hydrolyzed with conc. HCl, and the acid recrystallized from alcohol; yield, 80 per cent. On attempted recrystallization from water, p-hydroxymethyl benzoic acid results. Under the same hydrolytic conditions p-cyanobenzyl bromide is also converted into p-chloromethyl benzoic acid.

The reactivity of the hydroxyl group in certain alcohols: JAMES F. NORRIS and HENRY D. HIRSCH. The reactivity of the hydroxyl group in nine straight chain aliphatic alcohols was measured by determinations of their rates of reaction with aqueous hydrobromic acid at 100°. The rates were found to be related in a quantitative manner to the structure of the alcohols. If a

[1] The Los Angeles Meeting, August, 1925, of the Divisions of Organic Chemistry and of Medicinal Products.

hydrogen in each position relative to the hydroxyl group be assigned a certain number, called the reaction number, then the reaction constant for any of the nine alcohols can be found simply by finding the total of the reaction numbers of all the hydrogen atoms in the molecule. Designating the H on the carbonol carbon as "a," the next as "b," etc., we find that the reaction numbers of the hydrogen atoms are as follows: position a, .000109; b, .000015; c, .000066; d, .000010; e, .000045. Thus the reaction constant of n-propyl alcohol is $2\times.000109+2\times.000015+3\times.000066=.000446$. The experimental values were found to check the calculated values within a few per cent.

The behavior of acetylene and cuprous chloride catalysts in an ammonia system. II: EUGENE WILLIHNGANZ and J. A. NIEUWLAND. Acetylene condenses with aniline in the presence of the chlorides of copper or mercury to form a substance thought to be a polymer of ethylidine aniline. When this is heated in the presence of a small amount of acid, rearrangement takes place with the formation of products similar to those obtained by the action of aldehyde on aniline. Quinaldine and hydroquinaldine are present. N-ethyl aniline has been isolated, as also o- and p-ethyl anilines. Lepidine and gamma-methyl quinaldine are probably present as evidenced by reaction products. A new explanation of the mechanism of the Skraup synthesis of quinoline is offered.

The preparation of dihydroxymethylxanthene: EUGENE WILLIHNGANZ and J. A. NIEUWLAND. Acetylene reacts with resorcinol in a cold 10 per cent. sulfuric acid solution in alcohol, in the presence of mercuric sulfate, to give ethylidene diresorcinol. This compound readily loses water with the formation of dihydroxymethylxanthene. Paraldehyde may be substituted for the acetylene without decreasing the yield. When paraldehyde is used, the yield in all cases is about 50 per cent., based upon resorcinol used.

On the basis for the physiological activity of certain onium compounds. Derivatives of the betaines: R. R. RENSHAW and H. T. HOTCHKISS. The following derivatives of the betaines have been prepared by condensing the alpha halogen substituted acid derivatives with trimethyl amine. The methyl, ethyl, butyl and benzyl esters of the simple betaine, $(CH_3)_3N-CH_2-CO_2R$,

$(CH_3)_3N-\underset{\displaystyle Br}{\underset{|}{CH}}-CO_2Et$, $(CH_3)_3N-\underset{\displaystyle Br}{\underset{|}{CH}}-CO_2Et$,
$\quad\quad\quad